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Continental diatom biodiversity discovery and description in China: 1848 through 2019

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Abstract

In this paper we inventory the continental diatom taxa described from inland waters in China, from the first species descriptions dating back to 1848 through 2019. China's geography and hydrography are complex, including the world's highest mountains, many large rivers, salty lakes, and large karst regions. From this area, a total of 1128 taxa have been described from China over this time period. We examine the number of taxa described in ca. 20-year intervals and note the periods of time of no to few descriptions, versus time intervals with many taxon descriptions. Early on, taxon descriptions of freshwater diatoms from China were done by mostly by Europeans working alone, and the time frame of 1948 to 1967 had few descriptions, as a devasting famine and the cultural revolution impacted scientific work and productivity. B.V. Skvortzov produced a large number of taxon descriptions, during his time in residence in Harbin, later while in Sao Paulo, Brazil, and even posthumously. More recently, a wide range of labs and collaborations across China, and with a diverse array of international partners, is ushering in a new, robust era of research on the biodiversity of continental diatoms. A few areas of research and work for the future are discussed.

Keywords

new taxa, diatoms, Bacillariophyta, Skvortzov, China, continental

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Introduction

Asia has received considerable attention in the context of biodiversity discovery, biogeography and resolving the evolutionary history of a variety of lineages (Gower et al. 2012). It is an area harboring many endemic species and broader lineages (López-Pujol et al. 2011; Lu et al. 2018), relicts (Wu et al. 2007; López-Pujol and Ren 2009; Li et al. 2012a) as well as extinct taxa (Fu et al. 2019; Proust et al. 2020; Zhang 2020). Many diverse lineages have originated, radiated and gone extinct in China. This is true for many groups of organisms, including continental diatoms (see Skvortzov 1937; Hustedt 1938a, b, 1939; Williams 2004; Williams and Reid 2006; Kulikovskiy et al. 2012, 2015; Hamsher et al. 2014; Kociolek 2019).

Within China, there has been a long history and much recent attention on the description of many new species and even genera from continental ecosystems across the country. Interest in continental diatoms of China extends beyond biodiversity discovery to a rich array of work related to water quality and bioassessment (e.g. Ouyang et al. 2015), impacts of eutrophication and the creation of dams (Wang and Zhang 2004; Shen et al. 2018), paleoenvironmental reconstructions (Rioual and Wang 2009) and the development of many products with diatoms (Zhang et al. 2012; Wang and Seibert 2017; Zhang 2019).

The work on biodiversity discovery, as well as ecological work and more applied studies, depends on a working knowledge of the flora that has already been documented. We have compiled and present here a listing of the continental diatoms described from China to provide these descriptive and practical projects with a historical context and a baseline against future work can be compared. This compilation of new taxa described from China, and the publications in which they were presented, can also help interpret the history and development of diatom studies in China, from the middle of the 19th century to the present.

Methods

In our work developing this compilation of names of the continental diatoms described from China, we used the current geo-political circumscription of the country recognized by the United Nations. Our definition of "continental" refers to a variety of inland waters bodies, including freshwaters as well as those with high conductivity and, to some extent, 'salty' waters. But we have excluded taxa described from estuaries and marine localities from our review.

The bases of this compilation are the major resources for diatom nomenclature, including Catalogue of Diatom Names (Fourtanier and Kociolek 2011), DiatomBase (Kociolek et al. 2020) and AlgaeBase (Guiry and Guiry 2020). In addition, we reviewed several of the compilations of diatoms of China ("*Flora Algarum Sinicarum Aquae Dulcis*") and some primary literature that escaped the notice of these comprehensive works and summative projects. An important reference for this work is Jin

(1951), in which the knowledge of diatoms reported from China from 1848 to 1946, noting over 1000 taxa had been reported from marine and freshwater ecosystems, is summarized. The paper lists the taxa described from China (mostly by Skvortzov up to 1946). Although Jin (1951) did not document most of the other descriptions by European authors, both prior to and concurrent with Skvortzov, and his list obviously does not include post-1946 names, it is a great (but under cited) reference from which to develop a list of diatoms from China. The Skvortzov names were checked against the check list of his taxa compiled by Gololobova (2012). All of the names documented in this work have been included in DiatomBase.

Results

Continental diatoms described from China: An overview

In the 170-year history of continental diatom discovery in China, 1128 taxa have been described at the level of species and below (Table 1). This was not a smooth, equal accumulation of species over time, and if we examine the overall time period in groups of 20-year intervals, we can see there were times when significant numbers of taxa were described. For example, the time interval of 1928 to 1947 there were 355 taxa described in 16 publications, and between 1968 and 1987, 189 taxa were described in only 13 publications. In both instances, most of the publications were by a single author (See Appendices 1 and 2). On the other hand, in the more recent period of 2000 to 2019, the highest number of taxa were described (421), and published in 99 separate publications. Many of these papers were multi-authored. Periods of low publication of new species can be found in the earliest periods (1848–1887) and in the period 1948–1967 (Fig. 1).

In the next sections, we break down the work of continental diatom discovery in China into two periods, the initial period (1848–1999) and more recent period of continental diatom discovery (2000–2019). We examine the changes in approach and productivity during these time periods and compile a list of the taxa described and the references in which they were published.

The initial period: 1848–1999

Studies on the continental diatoms of China date back to the mid 1800's, to the work of Ehrenberg. From these initial works through ¾ of the 20th century, there were many studies that documented continental diatom taxa in China, with a few genera and many species and subspecific taxa being proposed. The majority of taxa described was at the subspecific level. In Appendix 1 we document the new genera, species and subspecific continental diatoms described from China in this time period. This list, based on more than 50 publications only, shows that there were 2 genera described from continentals of China (*Amphiraphia* Chen and Zhu 1983 and *Porosularia* Skvortzov

Table 1. Number of taxa described, Cumulative number of described taxa and number of publications in which new taxa were described from freshwaters in China, 1848–2019.

	Number of Taxa	Cumulative	Publications
1848–1867	9	9	2
1868–1887	0	9	0
1888–1907	28	37	1
1908–1927	57	94	2
1928–1947	355	449	16
1948–1967	8	457	2
1968–1987	189	646	13
1988–1999	61	707	17
2000–2019	421	1128	99

1976b). Neither of these genera have been reported since they were first described, and neither of these names are in use today.

Table 1 and Appendix 1 show that from 1848 until 1999, a total of 707 taxa were described from continental in China. Of these, 218 were recognized as separate species, while 489 were described as varieties and forms. These taxa were included across 48 genera. Genera with the most taxa described include *Pinnularia* (138), *Navicula sensu lato* (98), *Cymbella sensu lato* (56) and *Nitzschia* (43) and *Gomphonema* (39).

The data for this period were organized into 20-year intervals (except the last period) and show some interesting trends. The first works in which new taxa were described were penned by Europeans working alone. This included Ehrenberg being the first in 1848 and then again in 1854, but after that more than 50 years went by before another publication that included a new species described was produced. In 1906 Mereschkowsky studies diatoms from Tibet, and in 1922 Hustedt worked on diatoms from Tibet and the northwestern part of China. Starting in the late 1920's, through the 1940's, the description of continental diatom taxa was dominated by Boris V. Skvortzov. Williams et al. (2016) have provided insights into the life and work of Skvortzov, and Gololobova (2012) has created a checklist of the taxa described by him. Unlike his predecessors who described continental diatoms from China, Skvortzov actually lived and worked in China (though he studied from many parts of Asia, from the Philippines, Russia and to India, and further afield, and received samples from many individuals). His base was in Harbin, in Heilongjiang Province, in the northeastern part of the country. Thus, while species he described were from many areas and diverse ecosystems across China, many of the taxa described were from the northeastern part of the country. Skvortzov trained students in Harbin, and later work on diatom taxonomy in China has been carried out by three generations of scientists who can trace their academic lineages back to him. During the same time period as Skvortzov was describing many taxa, some Europeans also contributed to our knowledge of new continental diatoms, such as Skuja (1937) and Voigt (1942a, b).

In the period following Skvortzov's large work published in 1946, only one other publication appeared (in which 8 taxa were described), until another large work on the continental diatoms of China was published by Skvortzov in 1976. From 1950 to 1976

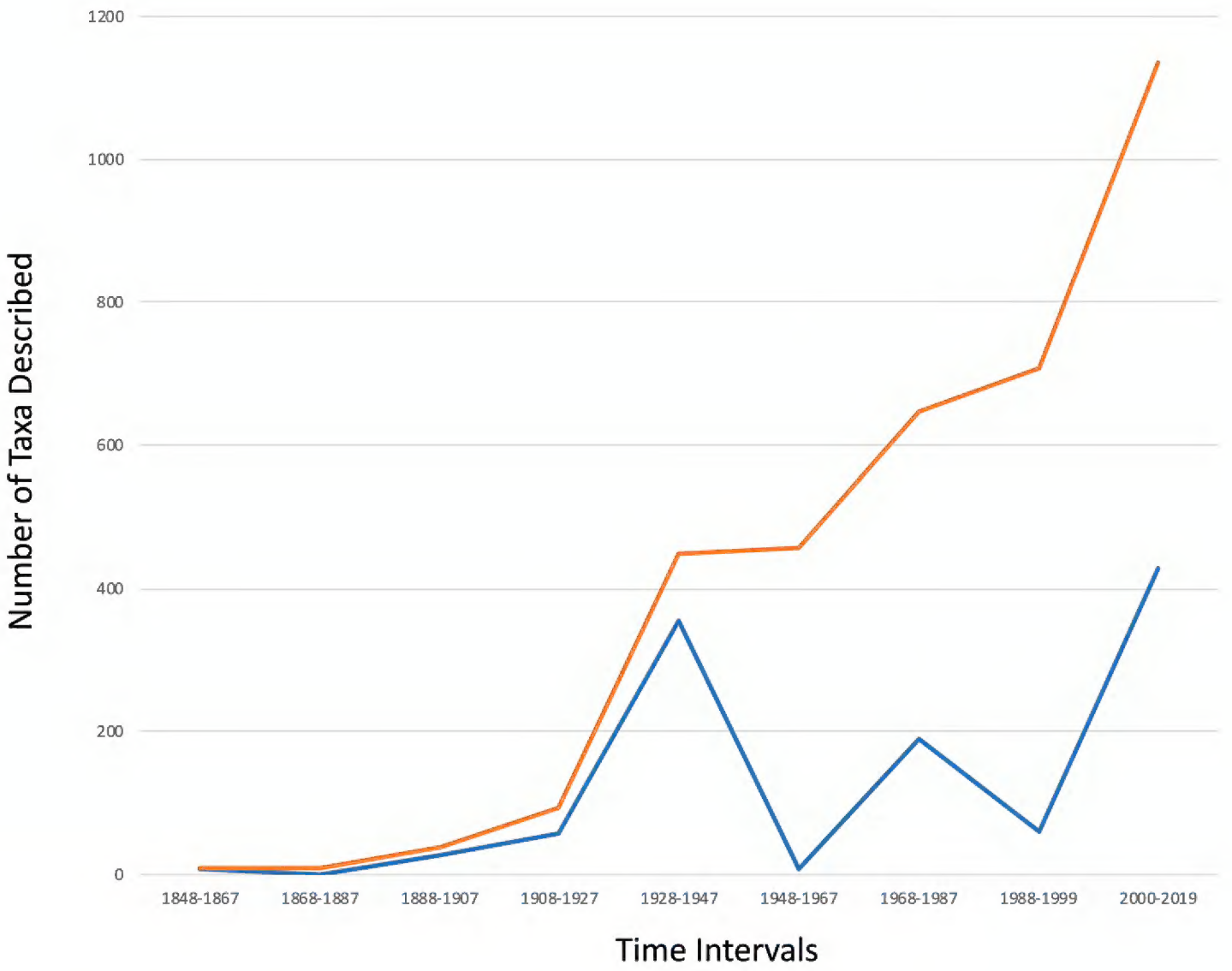

Figure 1. Number of species, varieties and forms described from freshwaters China, 1848–2019. The blue line represents the number of taxa described for each time interval. The orange line represents the cumulative number of taxa described over the entire period.

was a period of dramatic challenges and cultural change in China. The first occurred with the severe famine that hit the country in 1950, lasting three years. The impacts of that famine led to the deaths of tens of millions of people, and this had lasting impacts on society for many years afterwards. In addition, the Cultural Revolution, in part a reaction to the great famine, also had negative impacts on life in China, and those impacts on academics are well-documented. Thus, with the few publications produced in this time period within the narrow discipline of diatom taxonomy and biodiversity discovery, we can see the impacts of natural disasters, economic decline and political and cultural change on the output and continuation of scientific research and training.

Skvortzov left China during the cultural revolution, and ended up in Sao Paulo, Brazil. While there, he published two large works in which nearly 140 taxa were described from Chinese continental (Skvortzov 1976a, b). These were to be his last works on the topic of continental diatoms from China while he was alive. His collections have never been found (See Williams et al. 2016).

Despite his death, and the uncertainty regarding his collections, Skvortzov's legacy lives on with the works of his students, especially Professor Bao (who is currently in Harbin) and Professor Qi (who is currently in Guangzhou), both of whom are officially retired, as well as Professor Zhang, previously of Jinan University in Guangzhou (now deceased). All of these scientists ended up forming collaborations with scientists in the USA, with C.W. Reimer at the Academy of Natural Sciences of Philadelphia (who visited Harbin and hosted Bao, Qi and Zhang in Philadelphia) and E.F. Stoermer at the University of Michigan. Professor Qi visited Reimer at the Academy in Philadelphia while attending the International Diatom Symposium there in 1982 and stayed with Stoermer at his home in Ann Arbor, while on an extended trip to the USA in 1984. These connections yielded published collaborative works (Qi et al. 1984; Stoermer et al. 1986; Bao and Reimer 1992).

In the latter part of the 20th century, we see important floristic works being published on the diatoms from Tibet, Yunnan and other localities, and some emphasis on freshwater fossil diatoms by Chinese researchers. In these books and papers, a new generation of scientists had come on the scene, and there was the initiation of an important series focused on documenting the freshwater diatom flora of the country ("Flora Algarum Sinicarum Aquae Dulcis" Qi 1995; Qi and Li 2004; Li and Qi 2010; Shi 2004, 2013; Wang and You 2018).

The recent period (2000–2019)

In the 20-year time period, from 2000 to 2019, a total of 421 taxa, consisting of 252 species and 169 subspecific taxa across 67 genera have been described from continental waters in China (Appendix 2; Table 2). In addition, 6 new genera have been described. The breadth of lineages represented in these works during this period is remarkable, since several groups of "centric" and "araphid" diatoms have been described, as well as taxa among the major raphid lineages (Eunotiales, Bacillariales, Naviculales, Cymbellales, Rhopalodioid and Surirellales) are all included. For example, new genera of centric diatoms include *Edtheriotia* and the new genus of araphid diatoms is represented by *Tibetiella*. Raphid genera are included in the Eunotiales (*Sinoperonia*), Naviculales (*Sichuaniella*, *Pseudofallacia*) and Cymbellales (*Gomphosinica*). New species can be found among the centrics (in the genera *Cyclotella*, *Edtheriotia*, *Urosolenia*, *Orthoseira*, and *Melosira*), araphids (*Fragilaria*, *Tabularia*, *Diatoma* and *Tetracyclus*) and across the raphid diatoms, including the Eunotiales (*Eunotia*), Bacillariales (*Simonsenia*, *Achnanthes*), Monoraphids (*Achnanthidium*, *Platessa*), Naviculoids (*Germainiella*, *Neidium*, *Pinnularia. Muelleria*), Cymbelloids (*Cymbella*, *Delicata*), Rhopalodioids (*Epithemia*) and Surirelloids (*Cymatopleura*, *Surirella*). Please note that *Achnanthes*, though monoraphid, has been shown to be more closely related to members of the Bacillariales (Bruder and Medlin 2008); the monoraphid condition has evolved several times in the raphid diatom lineage (Kociolek et al. 2019a). Genera with the most species described in this period include *Pinnularia* (76), *Gomphonema*, (57), *Cymbella* (36), *Neidium* (22), *Amphora* (23).

Table 2. Number of taxa described, cumulative number of taxa, and number of publications in which taxa were described of freshwater diatoms in China, 2000–2019.

Year	Number of taxa described	Cumulative number of described taxa	Number of Publications
2000	2	2	1
2001	0	2	0
2002	1	3	1
2003	8	11	3
2004	10	21	2
2005	1	22	1
2006	1	23	1
2007	1	24	1
2008	1	25	1
2009	4	29	3
2010	8	37	6
2011	1	38	1
2012	209	247	3
2013	28	275	7
2014	17	292	7
2015	14	306	9
2016	11	317	9
2017	36	353	13
2018	38	391	15
2019	30	421	15
TOTAL	421		99

There is also great geographic breadth represented in these studies, with taxa being described in the northwestern portion of the country, Tibet and Yunnan, across the biodiverse regions of the karst belt extending from Yunnan to Guizhou, the central part of China, and from Hainan to the extreme Northeast.

Since 2000, there have been floristic studies that have yielded description of new taxa, such as Zhu and Chen's (2000) tome on the diatoms of Tibet, as well as revisionary work, such as Shi's (2004) study on gomphonemoid diatoms. While these were published in Chinese, the trend has been in more recent years for works to be published in English-language journals, such as Phytotaxa, Phycologia, Fottea, Cryptogamie: Algologie, Nova Hedwigia, and Diatom Research. Some research continues to be published in several Chinese-language journals as well.

In 2012, Kulikovskiy et al. included a paper offered by Gololobova and Kulikovskiy where they traced a manuscript submitted in the 1960's by Skvortzov to Dr. Proschkina-Lavrenko in Moscow for publication. but the paper was, for unknown reasons, never published. In this paper, which has been published in the 23rd volume of Iconographia Diatomologica, Skvortzov presents 445 taxa, that represent either new names, transfers or new taxon descriptions. This work includes taxa from India, China, Philippines, Japan, Korea, Australia and even Cuba. For the purposes of the current work, 208 of the taxa were newly described from China, and recorded for the year of publication (2012) even though the work was submitted 4 decades previously. These new taxon descriptions were not validly published (they lacked designation of type

specimens) but are included here since they represent the identification and publication of new taxa in China.

In total, since 2000, the 421 described taxa were included in nearly 100 published books and papers (Table 2), nearly twice the number of publications than was published in the preceding 150 years. In some of the recent studies, observations have verified the continued presence of endemics described in earlier works (e.g. *Gomphonema eminens* Skuja in Yunnan; Liu et al. 2020; several species of *Pinnularia* from the Great A'er Mountains; Liu et al. 2018; and species of centric diatoms from Yunnan), though the population sizes of these endemic taxa are reported to be declining (Li et al. 2012b).

The degree of collaboration between Chinese researchers within and between institutions, and the inclusion of students in these works, are both striking and a demonstration that this area of research will have a fruitful period of work ahead. Amongst the senior and corresponding authors of these papers we see the impact of Skvortzov, whose academic grandchildren and great-grandchildren working on freshwater diatoms are now in Shanghai, Taiyuan, and Harbin. There are also well-established labs in Beijing, Shanghai, Kunming, Nanjing, and Jishou, whose focus may include the study of ecological and palaeoecological interpretation, as well as biodiversity discovery and description. Collaborations with non-Chinese scientists is also hallmark of this most recent era, with partners joining in these works from the U.K., Spain, Macedonia, Germany, Luxembourg, Belgium, Canada, and the USA.

Discussion: A look ahead

While there has been a tremendous amount of work done to document the freshwater diatom flora of China, there are still many areas across the country that await initial or additional in-depth study. Some of these areas include, Yunnan Province, the vast karst region across Yunnan/Guangxi/Guizhou provinces, the subtropical southern part of the country, Xinjiang Autonomous Region, and Tibet, to name a few. In these regions are the two biodiversity hotspots the are fully in China (Myers et al. 2000; CEPF 2019). Also, the two longest rivers in China, The Yangtze River and Yellow River, have had isolated studies, but not comprehensive analyses. There exist specialized habitats such as also high mountain ranges, waterfalls, and hot springs, to name a few, where more intensive studies are warranted.

Perhaps one of the most challenging projects, with the potential of having the least "impact" (in the way most universities or state labs would assess that notion), but the greatest impact on the discipline, would be the typification of the diatom taxa described by Skvortzov. With the location of his collection uncertain (several generations of curators have attempted to track the collection to universities and institutes in China, Russia, Brazil, and Scandanavia), it seems likely that the collection has been lost. The challenge would not only be the large number of taxa he described. There would be a huge challenge to find specimens to designate as neotypes for his taxa, or to designate illustrations of his as epitypes. If neotypification was chosen, it would present

many challenges, especially in situations where several varieties or forms were dissected from the same species, or for the large number of taxa described in his 1976 and 2012 papers, where the illustrations are of a quality that might not facilitate making positive identifications. It also appears that the collections of Chen and Zhu have been lost, and typification of their taxa will also be an important activity for taxonomists.

The loss of several important collections in China is not restricted to that country. Collections have been discarded by many universities and research institutes across the world. Currently, China does not have a national diatom collection. Such a repository might be useful in the future, as the significant, current activities of collection-building and biodiversity discovery and description, which appears to still be in a log growth phase (see Fig. 1). The fate of the collections that have been established and blossomed in a single generation in Shanghai, Harbin, Taiyuan, Beijing and other labs will always be tenuous. Having a national collection would potentially provide a repository for the country to serve future generations of scientists.

Although there is tremendous described diversity in the continental diatom flora of China, and it is likely that there is still much to do to achieve a more comprehensive knowledge of that flora, the number of strains of continental diatoms in GenBank traceable to a source in China is modest. In fact, this is all the more surprising since some groups of continental diatoms have a tremendous diversity in China, and some endemic genera in Asia have representatives in the Chinese flora (Kociolek 2019). Some of these groups include the Thalassiosiraceae and Cymbellales. In the latter group, the only endemic genera known for that lineage worldwide are from Asia and include species from China (e.g. Zhang et al. 2018). Workflows and resources will need to be developed so that the number of molecular sequences generated from Chinese taxa are commensurate with the diversity and unique nature of the flora.

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Appendix I

Taxa of continental diatoms described from China, 1848–1999.

Achnanthes affinis var. *biseriata* Skvortzov 1938c
Achnanthes cucurbita Skvortzov 1935
Achnanthes fragilis Skvortzov 1938b
Achnanthes fukiensis Skvortzov 1929a
Achnanthes girinensis Skvortzov 1935
Achnanthes guizhouensis Chen and Zhu 1994
Achnanthes hedini Hustedt 1922
Achnanthes hankensis Skvortzov 1929c
Achnanthes himalayensis Jao and Zhu in Jao, Zhu and Lee 1974
Achnanthes inflata var. *sinica* Skvortzov 1929a
Achnanthes kansouensis Skvortzov 1935
Achnanthes linearis var. *kankouensis* Skvortzov 1935
Achnanthes linearis f. *minuta* Skvortzov 1935
Achnanthes medioconvexa Zhu and Chen 1996
Achnanthes mesoconstricta Zhu and Chen 1996
Achnanthes minutissima var. *constricta* Skvortzov 1935
Achnanthes pamirensis Hustedt 1922
Achnanthes pinnata Hustedt 1922
Achnanthes schmidtiana var. *tibetica* Jao and Zhu in Jao, Zhu and Lee 1974
Achnanthes sublinearis Skvortzov 1938c
Achnanthes sublinearis var. *complexa* Skvortzov 1938c
Achnanthes sublinearis var. *elliptica* Skvortzov 1938c
Achnanthes tibetica Jao 1964
Actinella brasiliensis var. *curta* Skvortzov 1929c
Actinella miocenica Li 1988
Amphiprora medulica var. *sinensis* Skvortzov 1927
Amphiraphia Chen and Zhu 1983
Amphiraphia xizangensis Chen and Zhu 1983
Amphiraphia xizangensis var. *major* Chen and Zhu 1983
Amphora angusta var. *sinensis* Skvortzov 1927
Amphora asiatica Skvortzov 1935
Amphora dalaica var. *hinganica* Skvortzov 1976b
Amphora dalaica var. *oculata* Skvortzov 1976b
Amphora delicatissima f. *sinica* Skvortzov 1935
Amphora geniculata Hustedt 1922
Amphora ostenfeldii Hustedt 1922
Amphora ovalis f. *mongolica* Skvortzov 1930
Amphora reniformis Guo, Xie and Li 1997

Anomoeoneis polygramma var. *rhomboides* Jao 1964
Anomoeoneis polygramma var. *tibetica* Jao 1964
Aulacoseira dianchiensis Yang, Stoermer and Kociolek 1994
Caloneis bacillum f. *latilanceolatum* Zhu and Chen 1995
Caloneis chansiensis Skvortzov 1935
Caloneis fasciata var. *pekinensis* Skvortzov 1928a
Caloneis holstii var. *tibetica* Jao 1964
Caloneis hunanensis Chen and Zhu 1989
Caloneis lepidula var. *angustata* Skvortzov 1976a
Caloneis patagonica var. *sinica* Skvortzov 1938c
Caloneis schroderi var. *densestriata* Skvortzov 1976a
Caloneis schumanniana var. *biconstricta* f. *minor* Zhu and Chen 1995
Caloneis silicula var. *hankensis* Skvortzov 1929c
Caloneis schumanniana f. *gracilis* Skvortzov 1935
Caloneis silicula var. *hinganica* Skvortzov 1976a
Caloneis sphagnicola Skvortzov 1938b
Ceratoneis arcus var. *orientalis* Skuja 1937
Cocconeis placentula var. *rotunda* Skvortow 1928a
Coscinodiscus sinicus Skvortzov 1946
Cyclotella asterocostata Lin, Xie & Cai in Xie et al. 1985
Cyclotella asterocostata var. *borealis* Xie and Cai 1985
Cyclotella asterocostata var. *striata* Chen 1987
Cyclotella curvistriata Chen and Zhu 1985
Cyclotella florida Voigt 1942
Cyclotella hinganica Skvortzov 1976a
Cyclotella hubeiana Chen and Zhu 1985
Cyclotella kuetzingiana var. *hankensis* Skvortzov 1929b
Cyclotella lacunarum Hustedt 1922
Cyclotella meneghiniana var. *hankiensis* Skvortzov 1929b
Cyclotella meneghiniana var. *hinganica* Skvortzov 1976a
Cyclotella miyiensis Qi and Yang 1985
Cyclotella obliquata Qi and Yang 1985
Cyclotella rhomboideo-elliptica Skuja, 1937
Cyclotella rhomboideo-elliptica var. *rounda* Qi and Yang 1985
Cyclotella shanxiensis Xie and Qi 1984
Cyclotella tibetana Hustedt 1922
Cymatopleura sinensis Skvortzov 1927
Cymatopleura solea var. *hankensis* Skvortzov 1929c
Cymbella affinis var. *elegans* Mereschkowsky 1906
Cymbella amphioxys var. *asiatica* Skvortzow 1938e
Cymbella amoyensis Voigt 1942
Cymbella angustata var. *hinganica* Skvortzov 1976b
Cymbella aspera var. *elongata* Skvortzov 1928b

Cymbella aspera var. *fossilis* Skvortzov 1937
Cymbella aspera var. *intermedia* Skvortzov 1929c
Cymbella aspera var. *manschurica* Skvortzov 1928b
Cymbella aspera var. *shantungensis* Voigt 1942
Cymbella australica var. *hankensis* Skvortzov 1929c
Cymbella austriaca var. *hankensis* Skvortzov 1929c
Cymbella cantonensis Voigt 1942
Cymbella cantonensis var. *obtusa* Voigt 1942
Cymbella cesatii var. *asiatica* Skvortzov 1938b
Cymbella cistula var. *asiatica* Mereschkowsky 1906
Cymbella cistula var. *heterostriata* Mereschkowsky 1906
Cymbella cistula var. *hinganensis* Skvortzov 1928b
Cymbella cistula var. *manschurica* Skvortzov 1928b
Cymbella cistula var. *recta* Shi 1991
Cymbella cistula var. *rotundata* Voigt 1942
Cymbella cistula var. *woosungensis* Voigt 1942
Cymbella delicatula var. *capitata* Skvortzov 1935
Cymbella delicatula var. *fasciata* Voigt 1942
Cymbella delicatula var. *magna* Chen & Zhu in Zhu & Chen, 1994
Cymbella ehrenbergii var. *apiculata* Skvortzov 1976b
Cymbella ehrenbergii var. *hankensis* Skvortzov 1929c
Cymbella globosa Voigt 1942
Cymbella gracilis var. *arcuata* Voigt 1942
Cymbella gracilis var. *arcuata* Skvortzov 1976b
Cymbella gracilis f. *crassiostriata* Skvortzov 1976b
Cymbella gracilis var. *kansouensis* Skvortzov 1935
Cymbella gracilis f. *sphagnicola* Skvortzow 1938e
Cymbella heteropleura var. hinganica Skvortzov 1976b
Cymbella lanceolata var. *grossepunctata* Skvortzov 1976b
Cymbella jianghanensis Shi 1991
Cymbella jilinensis Huang in Huang et al, 1983
Cymbella jolmolungenesis C.C. Jao & Y.Y. Lee in C.C. Zao, H.Z. Zhu & Y.Y. Lee 1974
Cymbella lacustris var. *subtropica* Voigt 1942
Cymbella lata var. *sinica* Skvortzov 1935
Cymbella muralis Skvortzov 1937
Cymbella naviculiformis f. *constricta* Skvortzov 1938d
Cymbella naviculiformis var. *stauroptera* Voigt 1942
Cymbella pavlovi Skvortzov 1938b
Cymbella perpusilla f. *elongata* Skvortzow 1938e
Cymbella ruttneri var. *liaotungensis* Skvortzov 1946
Cymbella signata var. *chinensis* Skvortzov 1929a
Cymbella sinica Skvortow 1938c
Cymbella sinica var. *miyiensis* Qi and Yang 1985

Cymbella stuxbergii var. *tumida* Skvortzov 1938c
Cymbella tenuistriata Shi 1991
Cymbella tibetana Hustedt 1922
Cymbella tumidula f. *recta* Skvortzov 1938c
Cymbella turgida var. *hinganica* Skvortzov 1976b
Cymbella ventricosa var. *major* Skvortzov 1929c
Cymbella ventricosa var. *pekinensis* Skvortzov 1929a
Cymbella ventricosa f. *major* Mereschkowsky 1906
Denticula elegans var. *hinganica* Skvortzov 1976b
Diatoma shenonngia Zhang and Qi 1994
Diploneis elliptica var. *hankae* Skvortzov1929b
Diploneis elliptica var. *mongolica* Mereschkowsky 1906
Diploneis finnica var. *sinica* Skvortzov 1929a
Diploneis lijingensis Huang in Huang et al. 1998
Diploneis rupestris Skvortzov 1938a
Discoplea atmosphaerica Ehrenberg 1848
Discoplea sinensis Ehrenberg 1848
Epithemia hyndmanii var. *chinensis* Skvortzov 1929a
Epithemia zebra var. *hankensis* Skvortzov 1929c
Eucocconeis hinganica Skvortzov 1976a
Eunotia anhuiensis J.Yang 1995
Eunotia arcus var. *bindulata* Skvortzov 1976a
Eunotia arcus var. *crassistriata* Skvortzov 1976a
Eunotia arcus var. *hinganica* Skvortzov 1976a
Eunotia arcus var. *triundulata* Skvortzov 1976a
Eunotia asiatica Skvortzow 1938e
Eunotia asiatica var. *interrupta* Skvortzow 1938e
Eunotia bigibba var. *rupestris* Skvortzov 1938a
Eunotia clevei var. *sinica* Skvortzov 1929a
Eunotia faba var. *lunata* Skvortzov 1976a
Eunotia faba var. *minor* Skvortzov 1976a
Eunotia formica var. *elongata* Skvortzov 1929c
Eunotia fragilariodes var. *elongata* Skvortzov 1929b
Eunotia gracilis var. *densestriata* Skvortzov 1976a
Eunotia hainanensis Zhang et Qi 1993
Eunotia hinganica Skvortzov 1976a
Eunotia lunaris var. *undulata* Skvortzov 1976a
Eunotia major var. *asiatica* Skvortzov 1929a
Eunotia major var. *hankensis* Skvortzov 1929b
Eunotia monodon var. *asiatica* Skvortzov 1936
Eunotia asiatica var. *interrupta* Skvortzow 1938e
Eunotia parallela f. *asiatica* Skvortzov 1938b
Eunotia parallela var. *hinganica* Skvortzov 1976a

Eunotia pectinalis var. *chinensis* Skvortzov 1929b
Eunotia plicata Jao 1964
Eunotia praerupta var. *tibetica* Mereschkowsky 1906
Eunotia sudetica var. *hankensis* Skvortzov 1929b
Eunotia suecica f. *hankensis* Skvortzov 1929c
Eunotia suecica var. *hinganica* Skvortzov 1976a
Eunotia suecica var. *simplex* Skvortzov 1976a
Eunotia tautoniensis var. *hankensis* Skvortzov 1929b
Eunotia tautoniensis var. *undulata* Skvortzov 1929c
Fragilaria asiatica Hustedt 1922
Fragilaria brevistriata var. *bigibba* Jao 1964
Fragilaria brevistriata var. *tibetica* Mereschkowsky 1906
Fragilaria curvata Skvortzov 1935
Fragilaria hainanensis Zhang et Qi 1994
Fragilaria hinganensis Skvortzov 1928b
Fragilaria hinganensis var. *longissima* Skvortzov 1928b
Fragilaria indigema Skvortzov 1976a
Fragilaria lapponica var. *lanceolata* Zhang and Qi 1994
Fragilaria leptostauron var. *hainanensis* Zhang in Zhang and Qi 1994
Fragilaria mesotyla Ehrenberg 1848
Fragilaria shangdongensis Li 1982
Fragilaria subtriundulata Li 1999
Fragilaria virescens var. *acicularis* Skvortzov 1976a
Fragilaria virescens var. *obtusa* Skvortzov 1976a
Fragilaria virescens var. *restratus* Skvortzov 1976a
Frustulia chinensis Skvortzov 1929b
Frustulia vulgaris var. *asiatica* Skvortzov 1928b
Frustulia vulgaris var. *constricta* Skvortzov 1929b
Frustulia vulgaris var. *muscosa* Skvortzov 1937
Frustulia vulgaris var. *rupestris* Skvortzov 1938a
Gloeonema sinense Ehrenberg 1848
Gomphonema acuminatum f. *elongatum* Skvortzov 1929c
Gomphonema acuminatum var. *sinica* Skvortzov 1935
Gomphonema acuminatum var. *tibeticum* Jao 1964
Gomphonema augur f. *hankensis* Skvortzov 1929c
Gomphonema augur f. *orientalis* Skvortzov 1929c
Gomphonema augur var. *sinica* Skvortzov 1946
Gomphonema changyangicum Li et al 1999
Gomphonema clevei f. *heterovalvata* Voigt 1942
Gomphonema clevei var. *sinensis* Voigt 1942
Gomphonema constrictum var. *amphicephala* Mereschkowsky 1906
Gomphonema constrictum var. *elongata* Skvortzov 1929c
Gomphonema constrictum var. *hankensis* Skvortzov 1929c

Gomphonema eminens Skuja 1937
Gomphonema hinganicum Skvortzov 1976b
Gomphonema hinganicum var. *apiculatum* Skvortzov 1976b
Gomphonema hedini Hustedt 1922
Gomphonema heideni var. *sinica* Skvortzov 1938c
Gomphonema hubeicum Li et al. 1999
Gomphonema instabilis f. *wangii* Bao and Reimer 1992
Gomphonema interruptum Chen and Zhu 1994
Gomphonema kasnakowi Mereschkowsky 1906
Gomphonema kasnakowi var. *distincta* Skvortzov 1938c
Gomphonema laojunshanensis Li, Kociolek and Metzeltin 2010b
Gomphonema licenti Skvortzov 1935
Gomphonema licenti var. *curta* Skvortzov 1935
Gomphonema longiceps var. *australica* Skvortzov 1976b
Gomphonema longiceps f. *minuta* Skvortzow 1938e
Gomphonema montanum f. *hankensis* Skvortzov 1929c
Gomphonema olivaceum var. *tibetica* Mereschkowsky 1906
Gomphonema parvulum var. *deserta* Skvortzov 1935
Gomphonema parvulum var. *sinica* Skvortzov 1935
Gomphonema puiggarianum var. *sinica* Skvortzov 1929b
Gomphonema ruttneri var. *liaotungensis* Skvortzov 1946
Gomphonema sinica Skvortzov 1929b
Gomphonema sphaerophorum var. *asiatica* Skvortzov 1929a
Gomphonema sphaerophorum var. *densestriatum* Zhu & Chen, 1994
Gomphonema subclavatum var. *hankensis* Skvortzov 1929c
Gomphonema tergestinum var. *shantungensis* Skvorttzow 1937
Gomphonema tropicale var. *nonpunctatum* Shi 1991
Gomphonema xiphoidea Skvortzov 1976b
Gyrosigma attenuatum var. *asiatica* Skvortzov 1938c
Gyrosigma hankensis Skvortzov 1929c
Gyrosigma spencerii var. *sinica* Skvortzov 1929b
Hantzschia amphioxys var. *compacta* Hustedt 1922
Hantzschia amphioxys f. *hankensis* Skvortzov 1929c
Hantzschia amphioxys var. *hinganensis* Skvortzov 1928b
Hantzschia amphioxys var. *sinica* Skvortzov 1946
Hantzschia elongata var. *curta* Skvortzov 1976b
Hantzschia elongata var. *densestriata* Skvortzov 1976b
Hantzschia elongata var. *obtusa* Skvortzov 1976b
Hantzschia elongata var. *tenua* Skvortzov 1976b
Mastogloia braunii var. *sinensis* Skvortzov 1927
Mastogloia grevillei var. *sinica* Skvortzov 1927
Mastogloia bruni var. *sinensis* Skvortzov 1927
Melosira bruni var. *sinensis* Skvortzov 1927

Melosira cuculleta Chen 1980
Melosira hunanica Chen & Zhu in Huang et al. 1998
Melosira irregularis var. *hankensis* Skvortzov 1929b
Melosira italica var. *hankensis* Skvortzov 1929b
Melosira radiato-sinuata Chen 1980
Melosira radiato-sinuata var. *yunnanica* Chen 1980
Melsoria roseana var. *asiatica* Skvortzov 1938a
Melosira roeseana var. *epidendron* f. *spinosa* Skvortzov 1938a
Melosira roseana f. *spinosa* Skvortzov 1938a
Melosira roeseana var. *xizangensis* Chen in Chen and Zhu 1995
Melosira sinensis Chen 1980
Melosira soochowensis Skvortzov 1946
*Melosira young*i var. *tenuissima* Skvortzov 1937
Meridion circulare var. *subcapitatum* Skvortzov 1976a
Navicula aktinoides Skuja 1937
Navicula americana f. *hankensis* Skvortzov 1929c
Navicula amphibola var. *manschurica* Skvortzov 1928b
Navicula anhuiensis Yang 1994
Navicula argunensis Skvortzov 1938d
Navicula bacillum var. *elongata* Skvortzov 1929c
Navicula bacillum var. *hankensis* Skvortzov 1929c
Navicula bacillum var. *parallela* Skvortzov 1938d
Navicula barentsii var. *capitata* Bao and Reimer 1992
Navicula bigibba Chen and Zhu 1994
Navicula brockmannii var. *undulata* Zhu and Chen 1996
Navicula bryophila var. *paucistriata* Zhu and Chen 1996
Navicula cantonensis Ehrenberg 1848
Navicula cari var. *rostrata* Skvortzov 1935
Navicula chansiensis Skvortzov 1935
Navicula chinensis Skvortow 1929b
Navicula cincta var. *kansouensis* Skvortzov 1935
Navicula cincta var. *minuta* Skvortzov 1937
Navicula cincta var. *sphagnicola* Skvortzow 1938e
Navicula cryptocephala var. *australis* Skuja 1937
Navicula cryptocephala var. *hankensis* Skvortzov 1929c
Navicula cuspidata f. *craticularis* Skvortzov 1929c
Navicula cuspidata var. *hankae* Skvortzov 1929c
Navicula cuspidata var. *tibetica* Jao 1964
Navicula exigua var. *signata* Skvortzov 1935
Navicula exigua var. *sinica* Skvortzov 1935
Navicula fukiensis Skvortzov 1929b
Navicula gastrum var. *hankensis* Skvortzov 1929c
Navicula gastrum var. *limnetica* Skvortzov 1929c

Navicula gastrum var. *mongolica* Skvortzov 1928c
Navicula hangchowensis Skvortzov 1937
Navicula hankae Skvortzov 1929c
Navicula hedini Hustedt 1922
Navicula hunanensis Chen and Zhu 1994
Navicula incerta f. *asiatica* Skvortzov 1935
Navicula jkarii Skvortzov 1929c
Naviculaa kalganica Skvortzov 1935
Navicula kotschyi f. *hinganica* Skvortzov 1976a
Navicula kotschyi var. *rupestris* Skvortzov 1938a
Navicula kovalchookiana Skvortzov 1937
Navicula laevissima var. *lanceolata* Skvortzov 1938a
Navicula laevissima var. *ovata* Skvortzov 1937
Navicula laevissima var. *robusta* Skvortzov 1938a
Navicula lagerheimii var. *capitata* Skvortzov 1937
Navicula lagerheimii var. *lanceolata* Skvortzov 1938a
Navicula lagerheimii var. *ovata* Skvortzov 1937
Navicula lagerheimii var. *robusta* Skvortzov 1938a
Navicula lambda var. *recta* Skvortzov 1929b
Navicula lambda var. *sinica* Skvortzov 1935
Navicula licenti Skvortzov 1935
Navicula menisculus var. *sinica* Skvortzov 1935
Navicula mongolica Skvortzov 1935
Navicula multipunctata Chen and Zhu 1994
Navicula muscosa Skvortzow 1938e
Navicula mutica var. *rhombica* Skvortzov 1938a
Navicula mutica var. sinica Yang 1994
Navicula nivalis var. *chinensis* Skvortzov 1929b
Navicula oblonga var. *linearis* Mereschkowsky 1906
Navicula ocellata Skvortzov 1938a
Navicula ocellata var. *polymorpha* Skvortzov 1938a
Navicula parva Skvortzov 1935
Navicula peregrina var. *asiatica* Skvortzov 1929c
Navicula peregrina f. *curta* Skvortzov 1929c
Navicula peregrina var. *hankensis* Skvortzov 1929c
Navicula peregrina var. *lanceolata* Skvortzov 1929c
Navicula peregrina var. *minuta* Skvortzov 1929c
Navicula peregrina var. *sinica* Skvortzov 1938c
Navicula perpusilloides Chen and Zhu 1994
Navicula praegnans Skuja 1937
Navicula pseudolinearis Hustedt 1922
Navicula pseudoseminulum Skvortzov 1935
Navicula puncticulata Skvortzov 1976a

Navicula pupula var. *elongata* Skvortzov 1976a
Navicula pupula var. *sinica* Skvortzov 1935
Navicula radiosa var. *hankensis* Skvortzov 1929c
Navicula radiosa var. *manschurica* Skvortzov 1928b
Navicula rhynchocephala var. *hankensis* Skvortzov 1929c
Navicula rhynchocephala f. *hankensis* Skvortzov 1929c
Navicula rhynchocephala var. *tenua* Skvortzov 1938c
Navicula semen var. *lineata* Skvortzov 1976a
Navicula seminuda C. Jao & Y.Y.Lee in Jao, Zhu and Lee 1974
Navicula seposita var. *major* Zhu and Chen 1994
Navicula setchwanensis Skuja 1937
Navicula siberica Skvortzov 1929c
Navicula sinensis Ehrenberg 1848
Navicula soehrensis var. *parallela* Skvortzow 1938e
Navicula soochowensis Skvortzov 1946
Navicula soodensis var. *mongolica* Skvortzov 1935
Navicula stagna Chen and Zhu 1994
Navicula subrhombica Hustedt 1922
Navicula subvitrea var. *maxima* Skvortzov 1938c
Navicula tientsinensis Skvortzov 1927
Navicula tytthocephala Skvortzov 1976a
Navicula viridula var. *alisoviana* Skvortzov 1929c
Navicula viridula var. *hankensis* Skvortzov 1929c
Navicula viridula var. *pamirensis* Hustedt 1922
Navicula viridula var. *rostrata* Skvortzov 1938d
Navicula viridula var. *pamirensis* Hustedt 1922
Neidium affine f. *manschurica* Skvortzov 1928b
Neidium affine var. *amphirhynchus* f. *manchuria* Skvortzov 1928b
Neidium affine f. *hankensis* Skvortzov 1929
Neidium bigibborum Zhu and Chen 1995c
Neidium bisulcatum f. *hankensis* Skvortzov 1929c
Neidium bisulcatum f. *latior* Skvortzov 1976a
Neidium bisulcatum f. *longissima* Skvortzov 1976a
Neidium bisulcatum var. *notata* Mereschkowsky 1906
Neidium bisulcatum f. *subcapitatum* Skvortzov 1976a
Neidium constrictum Zhu and Chen 1995
Neidium didelta Hustedt 1922
Neidium dilatatum var. angustatum Skvortzov 1976a
Neidium ellipticis Zhu and Chen 1995
Neidium ellipticum Voigt 1942
Neidium hankensis Skvortzov 1929
Neidium hitchcockii f. *hankensis* Skvortzov 1929c
Neidium hitchcockii var. obliquestriatum Skvortzov 1935

Neidium iridis var. *dissimilia* Jao & Zhu in Jao, Zhu and Lee 1974
Neidium iridis f. *hanganica* Skvortzov 1976a
Neidium iridis var. *orochenicum* Skvortzov 1976a
Neidium kozlowi var. *amphicephala* Mereschkowsky 1906
Neidium kozlowi var. *elliptica* Mereschkowsky 1906
Neidium kozlowi var. elpatievskyi f. majus Zhu and Chen 1995
Neidium kozlowi var. *hankensis* Skvortzov 1929c
Neidium kozlowi var. *parva* Mereschkowsky 1906
Neidium kozlowii Mereschkowsky 1906
Neidium manshuricum Skvortzov 1946
Neidium maximum var. *hankensis* Skvortzov 1929c
Neidium mirabile Hustedt 1922
Neidium oblongum Zhu and Chen 1995
Neidium punctulatum Hustedt 1922
Neidium radiosum Voigt 1942
Neidium rectum Hustedt 1922
Nitzschia acuta var. *hinganica* Skvortzov 1976b
Nitzschia amoyensis Skvortzov 1929a
Nitzschia amphibia var. *curta* Skvortzov 1928a
Nitzschia bacillariaeformis Hustedt 1922
Nitzschia bacilliformis Hustedt 1922
Nitzschia bacilliformis var. *elongata* Skvortzov 1935
Nitzschia bacillum Hustedt 1922
Nitzschia bremensis var. *sinica* Skvortzov 1935
Nitzschiaa capitellata var. *mongolica* Skvortzov 1935
Nitzschia capitellata var. *montana* Skvortzov 1938b
Nitzschia chinensis Hustedt 1922
Nitzschia denticula var. *elongata* Mereschkowsky 1906
Nitzschia denticulata Skvortzov 1935
Nitzschia denticulata var. *undulata* Skvortzov 1935
Nitzschia filia Skvortzov 1976b
Nitzschia filia var. *apiculata* Skvortzov 1976b
Nitzschia frustulum var. *asiatica* Hustedt 1922
Nitzschia frustulum var. *mongolica* Skvortzov 1935
Nitzschia gradifera Hustedt 1922
Nitzschia grigoriewi Mereschkowsky 1906
Nitzschia hankensis Skvortzov 1929c
Nitzschia heufleriana var. *asiatica* Skvortzov 1929c
Nitzschia ignorata var. *asiatica* Skvortzov 1938b
Nitzschia heidenii var. *pamirensis* Boye Peterson 1930
Nitzschia iugiformis Hustedt 1922
Nitzschia jugiformis Hustedt 1922
Nitzschia mongolica Skvortzov 1935

Nitzschia ostenfeldi Hustedt 1922
Nitzschia palea var. *gracilis* Skvortzov 1935
Nitzschia palea var. *hinganica* Skvortzov 1976b
Nitzschia pamirensis Hustedt 1922
Nitzschia pekinensis Skvortzov 1928a
Nitzschia pseudolinearis Hustedt 1922
Nitzschia regula Hustedt 1922
Nitzschia regula f. *pekinensis* Skvortzov 1928a
Nitzschia rigida var. *sinensis* Skvortzov 1927
Nitzschia sigma var. *serpentina* Skvortzov 1927
Nitzschia sinuata var. *constricta* Chen and Zhu 1989
Nitzschia subvitrea Hustedt 1922
Nitzschia tibetana Hustedt 1922
Nitzschia tingrica Jao & Lee in Jao, Zhu and Lee 1974
Nitzschia yunchengensis Xie and Li 1994
Nitzschia zabelini var. *hinganica* Skvortzov 1976b
Pliocaenicus cathayanus G.Wang 1999
Pliocaenicus jilinensis G.Wang 1999
Pinnularia acrosphaeria f. *hankensis* Skvortzov 1929c
Pinnularia aestuari var. *hinganica* Skvortzov 1976b
Pinnularia alpina f. *symmetrica* Mereschkowsky 1906
Pinnularia archaica Skvortzov 1976a
Pinnularia bogotensis var. *asiatica* Skvortzov 1938b
Pinnularia bogotensis var. *hankensis* Skvortzov 1929a
Pinnularia brebissonii f. *curta* Skvortzov 1929a
Pinnularia cardinalis var. *constricta* Skvortzov 1976b
Pinnularia cardinalis var. *fenestrata* Skvortzov 1976b
Pinnularia cardinalis f. *angustior* Skvortzov 1976b
Pinnularia cardinalis f. *hankensis* Skvortzov 1929c
Pinnularia cardinalis var. *hinganica* Skvortzov 1976b
Pinnularia cardinalis f. *minuta* Skvortzov 1976b
Pinnularia centropuncta Skvortzov 1976a
Pinnularia centropuncta var. *lineata* Skvortzov 1976a
Pinnularia cheng Skvortzov 1946
Pinnularia chinensis Skvortzov 1929a
Pinnularia cholnokyi Skvortzov 1976b
Pinnularia cholnokyi var. *unilateralis* Skvortzov 1976b
Pinnularia congeri Skvortzov 1976b
Pinnularia distinguenda var. *asiatica* Skvortzov 1938b
Pinnularia distinguenda f. *striolata* Skvortzov 1938b
Pinnularia distinguenda var. *sphagnalis* Skvortzow 1938e
Pinnularia divergens var. *continua* Mereschkowsky 1906
Pinnularia divergens var. *tumida* Skvortzov 1976a

Pinnularia divergentissima var. *capitata* Hustedt 1922
Pinnularia divergentissima var. *lata* Skvortzow 1938e
Pinnularia dorgogostaiskii var. *latior* Skvortzov 1976b
Pinnularia episcopalis var. *hankensis* Skvortzov 1929c
Pinnularia episcopallis var. *lineata* Skvortzov 1976a
Pinnularia episcopalis var. *manschurica* Skvortzov 1928b
Pinnularia esox var. *hinganica* Skvortzov 1976b
Pinnularia essentialis Skvortzov 1976a
Pinnularia fonticola Hustedt 1922
Pinnularia fritschiana Skvortzov 1976b
Pinnularia gibba f. *constricta* Skvortzov 1938b
Pinnularia gibba f. *polymorpha* Skvortzow 1938e
Pinnularia gracillima var. *hinganica* Skvortzov 1976a
Pinnularia hartleyana f. *minor* Skvortzov 1946
Pinnularia hedini Hustedt 1922
Pinnularia hinganica Skvortzov 1976b
Pinnularia interrupta f. *hankensis* Skvortzov 1929c
Pinnularia interrrupta var. *sinica* Skvortzov 1935
Pinnularia isostauron var. *orientalis* Skvortzow 1938e
Pinnularia karelica var. *subcapitata* Skvortzow 1938e
Pinnularia kisselewii Skvortzov 1976b
Pinnularia kisselewii var. *hinganica* Skvortozw 1976b
Pinnularia kisselewii var. *intermedia* Skvortzov 1976b
Pinnularia kisselewii var. *parallela* Skvortzov 1976b
Pinnularia kisselewii var. *subacuta* Skvortzov 1976b
Pinnularia lacushankae Skvortzov 1946
Pinnularia lata var. *hinganica* Skvortzov 1976a
Pinnularia lata var. *intermedia* Skvortzov 1976a
Pinnularia latofasciata Skvortzov 1946
Pinnularia legumen var. *hinganica* Skvortzov 1976a
Pinnularia leptosoma var. *hinganica* Skvortzov 1976a
Pinnularia liouana var. *hinganica* Skvortzov 1976a
Pinnularia major Skvortzov 1928b
Pinnularia major f. *hankensis* Skvortzov 1929c
Pinnularia major f. *hinganica* Skvortzov 1976a
Pinnularia major var. *shantungensis* Skvortzov 1937
Pinnularia mesolepta var. *angusta* f. *sinica* Skvortzov 1929a
Pinnularia mesolepta f. *hankensis* Skvortzov 1929c
Pinnularia mesolepta f. *hinganica* Skvortzov 1976a
Pinnularia mesolepta f. *sinica* Skvortzov 1929a
Pinnularia mesolepta f. *subundulata* Skvortzov 1929c
Pinnularia meyerii var. *hinganica* Skvortzov 1976b
Pinnularia microstauron f. *curta* Skvortzov 1929c

Pinnularia molaris var. *asiatica* Skvortzov 1938b
Pinnularia molaris var. *constricta* Skvortzov 1976a
Pinnularia molaris var. *hinganica* Skvortzov 1976a
Pinnularia mongolica Skvortzov 1935
Pinnularia mongolica var. *lanceolata* Skvortzov 1946
Pinnularia montana var. *sinica* Skvortzov 1929a
Pinnularia nobilis var. *constricta* Skvortzov 1976b
Pinnularia nobilis var. *densestriata* Skvortzov 1976b
Pinnularia nobilis var. *distincta* Skvortzow 1938e
Pinnularia nobilis var. *gracillima* Skvortzov 1976b
Pinnularia nobilis var. *manschurica* Skvortzov 1928
Pinnularia nobilis f. *minor* Skvortzov 1976b
Pinnularia nobilis var. *obesa* Skvortzov 1976b
Pinnularia nobilis var. *soochowensis* Skvortzov 1946
Pinnularia nobilis var. *triundulata* Skvortozw 1946
Pinnularia nodosa var. *hankensis* Skvortzov 1929c
Pinnularia nodosa var. *maakii* Skvortzov 1929c
Pinnularia patrickii Skvortzov 1976b
Pinnularia patrickii var. *angustata* Skvortzov 1976b
Pinnularia patrickii var. *interrupta* Skvortzov 1976b
Pinnularia patrickii var. *pandurinifomis* Skvortzov 1976b
Pinnularia polyonca var. *hinganica* Skvortzov 1976a
Pinnularia polyonca var. *major* Skvortzov 1929c
Pinnularia polyonca var. *sublinearis* Skvortzov 1976a
Pinnularia prima Skvortzov 1976a
Pinnularia prima var. *subcapitata* Skvortzov 1976b
Pinnularia reimerii Skvortzov 1976b
Pinnularia reimerii var. *interrupta* Skvortzov 1976b
Pinnularia savanensis var. *hinganica* Skvortzov 1976a
Pinnularia savanensis var. *ignota* Skvortzov 1976a
Pinnularia secunda Skvortzov 1976b
Pinnularia selengensis var. *hinganica* Skvortzov 1976a
Pinnularia sinomongolica Skvortzov 1976a
Pinnularia sinomongolica var. *angustior* Skvortzov 1976a
Pinnularia sphagnicola Skvortzow 1938e
Pinnularia spitzbergensis var. *hinganica* Skvortzov 1976a
Pinnularia stauroptera var. *chinensis* Skvortzov 1929a
Pinnularia stauroptera f. *hankensis* Skvortzov 1929c
Pinnularia stauroptera var. *recta* Skvortzov 1929c
Pinnularia stauroptera f. *subcapitata* Skvortzov 1929c
Pinnularia stomatophora var. *hinganica* Skvortzov 1976a
Pinnularia streptoraphe var. *asiatica* Skvortzov 1938b
Pinnularia streptoraphe var. *muscicola* Skvortzov 1976b

Pinnularia subborealis Hustedt 1922
Pinnularia subcapitata f. *constricta* Skvortzov 1938b
Pinnularia subcapitata var. *sinica* Skvortzov 1935
Pinnularia subcapitata f. *tenua* Skvortzov 1938e
Pinnularia subsolaris var. *asiatica* Skvortzow 1938e
Pinnularia subsolaris var. *interrupta* Skvortzov 1935
Pinnularia tibetana Hustedt 1922
Pinnularia tibetana var. *argunensis* Skvortzov 1938d
Pinnularia tibetana var. *stauroneiformis* Skvortzov 1946
Pinnularia tibetana var. *truncata* Skvortzov 1946
Pinnularia tibetica Mereschkowsky 1906
Pinnularia turizaninow Skvortzov 1976b
Pinnularia viridis f. *argunensis* Skvortzov 1938d
Pinnularia viridis var. *fasoiata* Skvortzov 1976b
Pinnularia viridis f. *hankensis* Skvortzov 1929c
Pinnularia viridis var. *hinganica* Skvortzov 1976b
Pinnularia viridis f. *hinganica* Skvortzov 1976b
Pinnularia viridis var. *jenisseyensis* Skvortzov 1976b
Pinnularia viridis f. *muscicola* Skvortzov 1976b
Pinnularia viridis var. *orientalis* Skvortzow 1938e
Pinnularia viridis var. *sinica* Skvortzov 1946
Pinnularia viridis var. *ussuriensis* Skvortzov 1929c
Pinnularia zabelini Skvortzov 1976b
Pinnularia zabelini var. *amurensis* Skvortzov 1976b
Pinnularia zabelini var. *dimidia* Skvortzov 1976b
Pinnularia zabelini var. *zeaana* Skvortzov 1976b
Pinnularia zabelini var. *interrupta* Skvortzov 1976b
Pleurosigma spenceri var. *sinensis* Skvortzov 1927
Pleurosigma spenceri var. *tientsinensis* Skvortzov 1927
Porosularia Skvortzov 1976b
Porosularia amoyensis Skvortzov 1976b
Porosularia borgei Skvortzov 1976b
Porosularia calawayi Skvortzov 1976b
Porosularia calawayi var. *undulata* Skvortzov 1976b
Porosularia chowyiliangi Skvortzov 1976b
Porosularia handel-mazzettii Skvortzov 1976b
Porosularia jurilyi Skvortzov 1976b
Porosularia jurilyi var. *striata* Skvortzov 1976b
Porosularia kolbei Skvortzov 1976b
Porosularia lackeyi Skvortzov 1976b
Porosularia liouningyanii Skvortzov 1976b
Porosularia meisteri Skvortzov 1976b
Porosularia merrilli Skvortzov 1976b

Porosularia poretskyi Skvortzov 1976b
Poroularia poroidea Skvortzov 1976b
Porosularia pseudoviridis Skvortzov 1976b
Porosularia pulchra Skvortzov 1976b
Porosularia scheschukewii Skvortzov 1976b
Porosularia skujae Skvortzov 1976b
Porosularia skujae var. *unilateralis* Skvortzov 1976b
Porosularia striata Skvortzov 1976b
Porosularia subsalsa Skvortzov 1976b
Porosularia wislouchi Skvortzov 1976b
Rhopalodia gibba var. *gracilis* Skvortzov 1976b
Rhopalodia gibba var. *major* Skvortzov 1928b
Rhopalodia gibberula f. *mongolica* Mereschkowsky 1906
Rhopalodia gibberula f. *tibetica* Mereschkowsky 1906
Rhopalodia pseudogibba Skvortzov 1976b
Rhopalodia tibetica Mereschkowsky 1906
Schizostauron sorokninii Mereschkowsky 1906
Scoliopleura pavlovi Skvortzov 1930
Stauroneis anceps var. *hankensis* Skvortzov 1929c
Stauroneis anceps var. *oblonga* Skvortzov 1929c
Stauroneis anceps var. *orientalis* Skvortzov 1929c
Stauroneis anceps var. *hinganica* Skvortzov 1976a
Stauroneis anceps var. *kansouensis* Skvortzov 1935
Stauroneis anceps var. *ussuriensis* Skvortzov 1929c
Stauroneis chinensis Skvortzov 1929b
Stauroenis gregori var. *hankensis* Skvortzov 1929c
Stauroneis jimeiensis Lin 1989
Stauroneis laticeps Hustedt 1922
Stauroneis okamurae Skvortzov 1929c
Stauroneis parvula var. *rupestris* Skvortzov 1937
Stauroneis phoenicenteron f. *curta* Skvortzov 1929c
Stauroneis phoenicenteron var. *genuina* Skvortzov 1928b
Stauroneis phoenicenteron var. *hankensis* Skvortzov 1929c
Stauroneis phoenicenteron f. *hankensis* Skvortzov 1929c
Stauroneis phoenicenteron var. *oblongella* Skvortzov 1929c
Stauroneis rupestris Skvortzov 1938a
Stauroneis tibetica Mereschkowsky 1906
Stauroptera granulata Ehrenberg 1848
Stenopterobia sigmoidea Skvortzov 1976
Stephanodiscus sinensis Ehrenberg 1854
Stephanodiscus soochowensis Skvortzov 1946
Surirella alisoviana Skvortzov 1929c
Surirella angusta var. *amoyensis* Skvortzov 1929b

Surirella angusta var. *constricta* Skvortzov 1929c
Surirella angusta var. *curta* Skvortzov 1929c
Surirella angusta var. *elongata* Skvortzov 1929c
Surirella angusta var. *hankensis* Skvortzov 1929b
Surirella angusta f. *ovata* Skvortzov 1929c
Surirella biseriata var. *orientalis* Skvortzov 1929c
Surirella biseriata var. *ussuriensis* Skvortzov 1929c
Surirella borscowi Mereschkowsky 1906
Surirella capronii var. *hankensis* Skvortzov 1929c
Surirella chachinae Skvortzov 1929c
Surirella didyma var. *hinganica* Skvortzov 1976b
Surirella elegans var. *hankensis* Skvortzov 1929c
Surirella elliptica Ehrenberg 1848
Surirella engleri var. *hankensis* Skvorttzow 1929c
Surirella fukiensis Skvortzov 1929a
Surirella hinganica Skvortzov 1976b
Surirella linearis var. *vermifera* Skvortzov 1938c
Surirella ovalis var. *hankensis* Skvortzov 1929c
Surirella ovalis f. *tientsinensis* Skvortzov 1927
Surirella ovata f. *curta* Skvortzov 1930
Surirella ovata f. *mongolica* Skvortzov 1930
Surirella patella var. *hankensis* Skvortzov 1929c
Surirella robusta var. *hankensis* Skvortzov 1929c
Surirella robusta var. *manschurica* Skvortzov 1928b
Surirella saxonica var. *sinica* Skvortzov 1929a
Surirella splendida var. *hankensis* Skvortzov 1929c
Surirella tenera var. *hinganica* Skvortzov 1976b
Surirella tibetica Mereschkowsky 1906
Surirella tientsinensis Skvortzov 1927
Surirella ussuriensis Skvortzov 1929c
Surirella ussuriensis var. *elegans* Skvortzov 1929c
Surirella ussuriensis var. *elongata* Skvortzov 1929c
Synedra affinis var. *sinica* Skvortzov 1935
Synedra amphicephala var. *asiatica* Skvortzov 1935
Synedra licenti Skvortzov 1935
Synedra mazamaensis var. *changbaiensis* Bao and Reimer 1992
Synedra rumpens var. *sinica* Skvortzov 1935
Synedra tenera var. *sinica* Skvortzov 1935
Synedra ulna f. *constricta* Skvortzov 1938c
Synedra ulna f. *curta* Skvortzov 1928c
Synedra ulna var. *anhuiensis* Yang 1990
Synedra ulna var. *intermedia* Mereschkowsky 1906
Synedra ulna var. lanceolata f. *constricta* Skvortzov 1938c

Synedra ulna var. *mongolica* Skvortzov 1928c
Synedra ulna var. *tenuirostris* Skvortzov 1938c
Synedra vaucheriae var. *capitata* Skvortzov 1938c
Tetracyclus celatom var. *minor* Li 1999
Tetracyclus dunhuanensis Li 1984
Tetracyclus ellipticus var. *austrochinensis* Zhang 1994
Tetracyclus ellipticus var. *ovaliformis* Li 1984
Tetracyclus ellipticus var. *rostrata* Li 1984
Tetracyclus jaoi Li 1984
Tetracyclus minutus Li 1999
Tetracyclus mucronatus Li 1999
Tetracyclus navicularis Li 1984
Tetracyclus ovaliformis Li 1984
Tetracyclus radiatus Li 1999
Tetracyclus rupestris var. *subclypeatus* Li 1999
Tetracyclus shangduensis Li 1984
Tetracyclus sinensis Li 1984
Tetracyclus subclypeus Li and Williams 1990
Tetracyclus subdivisium Williams and Li 1990
Tetracyclus subdivisium var. *ellipticus* Li 1999
Thalassiosira lacustris var. *crassiospinua* Cai et Xie in Xie and Cai 1981
Tropidoneis maxima var. *sinensis* Skvortzov 1927
Tryblionella debilis var. sinensis Skvortzov 1927
Tryblionella hantzschiana f. *sinensis* Skvortzov 1927
Tryblionella tryblionella Skvortzov 1929c
Tryblionella tryblionella f. *hankensis* Skvortzov 1929c

Appendix 2

Listing of New Taxa Described from continental waters of China, 2000–2019. Genera are in bold.

Achnanthes chinii Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes coarctata subsp. *fukinensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes dalaica Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes drepanocladoides Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes drepanocladoides var. *fukinensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes gracillima var. *sinica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012

Achnanthes hankiana var. *sinica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes kansouensis var. *septentrionalis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes kryophila subsp. *distincta* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes kryophila var. *sinica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes lanceolata var. *argunensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes lanceolata var. *elliptica* f. *asiatica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes linearis var. *szechwanica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes minutissima var. *bistriata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes maolanensis P.Yu, Kociolek, & Q-M.You in Q-M.You et al. 2019b
Achnanthes montana var. *sinica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes pseudoexigua Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes pseudoexigua var. *unilateralis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes radiata Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes rarissima Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthes striatella Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Achnanthidium epilithica P.Yu, Q-M.You & Q-X Wang in Yu et al. 2019c
Achnanthidium guizhouensis P.Yu, You & Kociolek in You et al. 2019a
Achnanthidium jiuzhaienis P.Yu, Q-M.You & Q-X Wang in Yu et al. 2019c
Achnanthidium lacustre P.Yu, Q-M. You et Kociolek in Yu et al. 2019b
Achnanthidium limosua P.Yu, Q-M. You & Q-X Wang in Yu et al. 2019c
Achnanthidium longissimum P.Yu, Q-M.You & Kociolek in Yu et al. 2019a
Achnanthidium mediolanceolatum P.Yu, Q-M.You & Kociolek in You et al. 2019a
Achnanthidium parvulum You, Q-M.You & Kociolek in You et al. 2019a
Achnanthidium sinense B.Liu & S.Blanco in B. Liu et al. 2016
Achnanthidium sublanceolatum P.Yu, Q-M.You et Kociolek in Yu et al. 2019b
Achnanthidium subtilissimum P.Yu, Q-M.You & Q-X Wang in Yu et al. 2019c
Achnanthidium taipingensis P.Yu, Q-M.You et Kociolek in Yu et al. 2019b
Adlafia sinensis B.Liu & D.M.Williams in B.Liu et al. 2017
Amphora chu-yin-changii Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora dalaica Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora dalaica var. *bistriata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012

Amphora dalaica var. *latostriata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora dalaica var. *oculata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora delicatissima var. *dalaica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora delicatissima var. *pekinensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora epithemiformis Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora jao Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora liouiana Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora meyeri Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora normanii var. *alkalina* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora normanii var. *curta* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora normanii var. *curta* f. *mongolica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora normanii var. *interrupta* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora normanii var. *pekinensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora normanii var. *poyangi* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora perpusilla var. *mongolica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora perpusilla var. *pekinensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora perpusilla var. *subelliptica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora subsalina Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora wangchanii Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Amphora wang-wei Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Aneumastus yamdrokensis Q.Liu & S.L. Xie in Q.Liu et al. 2018
Caloneis clevei var. *parallela* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Clipeoparvus tibeticus Q.Liu, Kociolek & Xie in Q.Liu et al. 2019b
Cocconeis pediculus var. *cruciata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cocconeis pediculus var. *emarginata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Coscinodiscus rothii var. *sibirica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012

Coscinodiscus sinicus var. *sinica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cyclotella changhai J.-X. Xu & J.P. Kociolek in Xu et al. 2017
Cyclotella glomerata var. *argunensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cyclotella kutzingiana subsp. *densestriata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cyclotella kutzingiana var. *dalaica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cyclotella meneghiniana var. *pumila* fo. *sibirica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymatopleura elliptica var. *sinica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymatopleura aquastudia Kociolek & You in You et al. 2017b
Cymatopleura xinjiangiana You & Kociolek in You et al. 2017b
Cymbella chow-yi-liangii Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella cistuloides var. *angulata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella cistuloides var. *angulata* f. *corni-caprae* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella cistuloides var. *angulata* f. *minor* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella cistuloides var. *bilateralis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella cistuloides var. *truncata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella cistuloides var. *undulata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella dalaica Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella gracilis var. *sinica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella distalebiseriata B.Liu & D.M.Williams in B.Liu et al. 2018d
Cymbella fuxianensis Y.Li & Gong in Gong and Li 2011
Cymbella hechiensis Y.Li & W.Zhang in Zhang et al. 2019
Cymbella heihainensis Y.Li & Gong in Hu et al. 2013
Cymbella hubeiensis Y.Li Y. in Gong et al. 2013
Cymbella jianghanensis Y.Li in Gong et al. 2013 (nomen nudum)
Cymbella khokhensis Metzeltin, Lange-Bertalot & Li in Metzeltin et al. 2009
Cymbella liyangensis Zhang, Jüttner & E.J. Cox, 2018
Cymbella moelleriana var. *argunica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella pekinensis Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012

Cymbella paenetruncata Y.Li & Z.Gong in Gong et al. 2013
Cymbella pamirensis Z.Zhang & Rioual in Z.Zhang et al. 2017
Cymbella pseudotumida Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella pseudotumida var. *pseduoborealis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella rupicola var. *sinica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella semicircularis var. *dalaica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella sinica var. *rostrata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella sinuata var. *argunensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella tumida var. *convergentistriata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella tungtingiana Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Cymbella pulchra Y.Li & Lange-Bertalot in Gong et al. 2013
Cymbella shii Y.Li in Gong et al. 2013
Cymbella shudunensis. YLi & Metzeltin in Hu et al. 2013
Cymbella sinensis Metzeltin & Krammer in Krammer 2002
Cymbella xingyunnensis Y.Li & Gong in Hu et al. 2013
Cymbella yabe var. *punctata* Y.Li & Shi in Li et al. 2003
Cymbella yangtzensis Y.Li & D.Metzeltin in Gong et al. 2013
Cymbopleura pseudokuelbsii Shi 2013
Delicata changqingensis W.Zhang, S.Q.Yang & S. Blanco in Zhang et al. 2019
Delicata sinensis Krammer and Metzeltin 2003
Delicata williamsii B.Liu & S. Blanco in Bing Liu et al. 2018b
Diatoma kalakulensis Peng, Rioual & D.M. Williams, 2017
Diatoma rupestris Y.Liu & Wang in Y.Liu et al. 2010
Diploneis barbatula Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Diploneis parma var. *sinoborealis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Diploneis pseudoovalis var. *tiensinensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Diploneis smithii var. *denseareolata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012

Edtheriotia Kociolek, Q.You, Stepanek, R.L.Lowe & Q-X.Wang, 2016a

Edtheriotia guizhoiana Kociolek, You, Stepanek, R.L.Lowe & Q-X.Wang 2016a
Entomoneis triundulata B.Liu & D.M.Williams in B.Liu et al. 2018c

Epithemia arguiformis Q-M.You & Q-X.Wang, 2009
Eucocconeis lichunhaii Y.Li in Y.Li and Gong 2013
Eunotia arcus var. *undulata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Eunotia bigibba var. *subcapitata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Eunotia diodon var. *fukinensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Eunotia filiformis Luo et al. 2019
Eunotia monodon var. *amoyensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Eunotia pectinalis var. *amoyensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Eunotia mugecuo Luo et al. 2019
Eunotia pectinalis var. *bigibba* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Eunotia pectinalis var. *curta* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Eunotia pectinalis var. *sinica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Eunotia praerupta var. *sinica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Eunotia shantungensis Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Eunotia shantungensis var. *linealata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Eunotia sudeticiformis Kociolek et al. 2016b
Eunotia tauntoniensis var. *amoyensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Eunotia tridentula var. *sinica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Eunotia valida var. *densistriata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Eunotia valida var. *sinica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Fragilaria crenophila var. *sinensis* Rioual in Rioual et al. 2017a
Geissleria jianghanensis Y.Li inY. Li et al. 2005
Germainiella guizhouiana Kociolek et al. 2019b
Germainiella maolaniana Kociolek et al. 2019b
Germainiella sinica Kociolek et al. 2019b
Gomphocymbella asymmetrica Shi & Y.Li in Shi et al. 2003
Gomphocymbella laxistriata Shi & Y.Li in Shi et al. 2003
Gomphoneis distorta Q-M.You & Kociolek in Q-M. You et al. 2013

Gomphoneis pseudosubtiloides Q-M.You & Kociolek in Q-M. You et al. 2013
Gomphoneis qii Q-M.You & Kociolek in Q-M. You et al. 2013
Gomphoneis rostratoides Q-M.You & Kociolek in Q-M. You et al. 2013
Gomphoneis stoermeri Q-M.You & Kociolek in Q-M. You et al. 2013
Gomphoneis subtiloides Q-M.You & Kociolek in Q-M. You et al. 2013
Gomphoneis xinjiangiana Q-M.You & Kociolek in Q-M. You et al. 2013
Gomphonema acuminatum var. *obtusum* Y.Fan & Bao in Fan et al. 2004
Gomphonema argunensis Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Gomphonema asiaticum Y.Liu & Kociolek in Y.Liu et al. 2013
Gomphonema augur var. *poyangiana* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Gomphonema clevei var. *oryzae* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Gomphonema constrictum var. *tumidum* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Gomphonema gordejevi Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Gomphonema heideni var. *mingiana* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Gomphonema intricatum var. *curvatum* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Gomphonema jao Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Gomphonema kaznakowi var. *mingiana* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Gomphonema bicepiformis Zhang & Kociolek,2018b
Gomphonema bigutianchnensis Y.Li in Liao and Y.Li 2018
Gomphonema chinense Y.Liu & Kociolek in Y.Liu et al. 2013
Gomphonema constrictum var. *ellipticum* Z.X.Shi & J.Y.Chen in Shi 2004
Gomphonema dichotiforme Z.X.Shi, 2004
Gomphonema genestoermeri Y.Liu & Kociolek in Y.Liu et al. 2013
Gomphonema heilongtanensis Y.Li, Kociolek & D.Metzeltin, 2010
Gomphonema instabilis var. *rhombicum* S.Q.Xie & Z.H.Shi in Shi 2004
Gomphonema intricatoides Q-M.You & Kociolek, 2015
Gomphonema intricatum var. *mirum* Z.X.Shi & H.Z.Zhu, 2004
Gomphonema jianghanense Y.Li, Z.J.Gong, P.Xie & J.Shen, 2007
Gomphonema kaznakowi var. *cruciatum* Z.X.Shi & Y.Li in Shi 2014
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Gomphonema lanceolatum var. *curtum* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Gomphonema longiceps var. *rupestris* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012

Gomphonema mediocris Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Gomphonema mediocris var. *capitatum* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Gomphonema mereschkowskyii Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Gomphonema mereschkowskyii subsp. *lancetulum* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Gomphonema olivaceum var. *argunensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
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Navicula subocculata var. *parallelistriata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Navicula wangii Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Navicula wangii f. *constricta* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
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Nitzschia acuta var. *argunensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Nitzschia angustata var. *dalaica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Nitzschia apiculata var. *latostriata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Nitzschia fonticola var. *acuta* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Nitzschia gracilis var. *minuta* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Nitzschia hastata Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Nitzschia hastata var. *obtusa* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Nitzschia hastata var. *parallelistriata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Nitzschia intermedia var. *sinica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Nitzschia kalganica Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Nitzschia linearis var. *robustrior* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Nitzschia obtusa var. *minuta* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Nitzschia parvula var. *recta* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012

Nitzschia recta var. *lanceolata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Nitzschia recta var. *tenuirostris* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Nitzschia sheshukowae Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Nitzschia sinuata var. *undulata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Nitzschia tryblionella f. *obtusiuscula mongolica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Nitzschia tryblionella var. *tungtingiana* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
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Pinnularia appendiculata var. *densestriata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia argunensis Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia balfouriana var. *brevicostata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia aquaedulcis Y.Liu, Kociolek & Q-X.Wang in Kociolek et al. 2018
Pinnularia borealis var. *densestriata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia braunii var. *angustata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia braunii var. *curta* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia ceylonica var. *costulata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia ceylanica var. *gigantea* Skvortzov, 2012 (original description)
Pinnularia composita Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia composita var. *acuta* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia composita var. *distincta* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012

Pinnularia composita var. *linearis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia dactylus var. *convergentissima* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia dactylus var. *mingiana* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia dactylus var. *semitropica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
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Pinnularia daerbinsis Y.Liu, Kociolek & Q-X.Wang in Y.Liu et al. 2018a
Pinnularia dicephala Y.Liu, Kociolek & Q-X.Wang in Y.Liu et al. 2018a
Pinnularia distans Y.Liu, Kociolek & Q-X.Wang in Y.Liu et al. 2018a
Pinnularia elliptica Y.Liu, Kociolek & Q-X.Wang in Y.Liu et al. 2018a, accepted as *Pinnularia palidis* Y.Liu, Kociolek & Q-X.Wang in Kociolek et al. 2018
Pinnularia episcopalis var. *mingiana* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia gibba var. *mingiana* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia gibba var. *lata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia gigantea Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia gigantea var. *interrupta* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia gigantea var. *minor* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia hartleyana var. *amurensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia gracile Y.Liu, Kociolek & Q-X.Wang in Y.Liu et al. 2018a
Pinnularia hemiptera var. *longilineata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia interrupta var. *tungtingiana* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia jao Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia kolbei Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia krasskei Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia krasskei var. *latior* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia lacushankae var. *convergenda* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia lata var. *amurensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012

Pinnularia lata var. *linearis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia legumen var. *sinica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia liouniata Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia major var. *sinica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia meisteriana Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
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Pinnularia platycephala var. *nipponica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia polyonca var. *nipponica* f. *australis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
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Pinnularia sinicorum Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia stauroptera var. *mingiana* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia stauroptera var. *rostrata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia streptoraphe var. *argunensis* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia streptoraphe var. *tumida* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Pinnularia subcapitata var. *mingiana* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
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Rhopalodia gibba var. *dalaica* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Rhopalodia pseudogibba Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Rhopalodia pseudogibba var. *arcuata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Rhopalodia pseudogibba var. *pseudoventricosa* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Stauroneis javanica var. *truncata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Stenopterobia recta Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Stephanodiscus argunensis Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Stephanodiscus argunensis var. *simple* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Stephanodiscus hustedtii Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
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Surirella tientsinensis var. *striolata* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Surirella wulingensis B.Liu & Ector in B.Liu et al. 2019c
Synedra amoyensis Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Synedra arguinensis Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Synedra chungii Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Synedra sinica Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Synedra sinica var. *recta* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Synedra tenera var. *subtenera* Skvortzov ex Gololobov & Kulikovskiy in Kulikovskiy et al. 2012
Synedra ulna var. *repanda* Wang & You in You et al. 2008
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